GENERAL REFLECTIONS ON THE DEFINITION OF ANALOGUES AND CONSEQUENCES FOR THE EURO-CARES PROJECT. F. Foucher[1], F. Westall[1], J. Zipfel[2], N. Bost[1] and the EURO-CARES Team, [1]Centre de Biophysique Moléculaire, CNRS, rue Charles Sadron, 45071 Orleans, France, frederic.foucher@cnrs.fr, [2]Forschungsinstitut und Naturmuseum Senckenberg, Senckenberganlage 25, 60325 Frankfurt am Main, Germany.

Introduction: Most astrobiological investigations have been, are, and will be, focussed on solid materials including rocks, soil, and ices. However, natural materials can be very complex in composition, and the potential traces of life and/or molecules of astrobiological interest that they could contain may be very subtle and challenging to detect; hence, the importance of prior preparation for the missions using analogues. Analogues are terrestrial sites or samples having properties more or less similar than those expected on a given extraterrestrial body. There is a huge variety of analogues on Earth that can be used for many purposes: to test spacecraft landing and rover mobility, to test and calibrate instruments and sample preparation systems for *in situ* missions before launch, to help interpretation of data acquired during missions, and to carry out laboratory experiments. Analogue samples include minerals and rocks, as well as chemical, biological and material samples.

On the use of analogues: It is crucial to cross-calibrate the payload of a mission before launch using analogue samples. Thus, we have developed a collection of analogue rocks, the *International Space Analogues Rockstore* (ISAR, www.isar.cnrs-orleans.fr) in Orléans (France) that can be used to test and calibrate space instruments[1]. This collection was used to make a "blind test" consisting of analyses of two unknown samples using a part of the ExoMars 2020 payload[2]. Data from each instrument were presented to geologists having no prior knowledge of the rocks for interpretation. The geologists were able to make relatively detailed interpretations, thus demonstrating that the use of complementary payload data can compensate for the technical limitations of the instruments (when compared with laboratory instruments).

On the limit of analogues: The term analogue may be confusing when applied to astrobiology. For instance, while basalts can be considered as an analogue of Martian rocks (since basalts have been found on Mars), analogue life forms, e.g. terrestrial extremophiles are less obvious simply because life has never been found on Mars. The latter may thus be deemed putative analogues to be used for scientific purposes more than for instrument testing. For instance, study the metabolisms of extremophiles living in analogue environments is interesting to search for the fundamental requirements necessary to live in these particular environments, *i.e.* study convergent evolution to find convergent biosignatures.

Moreover, depending on the precision needed and on their specific use, the degree of analogy of sites or samples may be more or less important. For instance, if the aim is to test rover mobility, the composition of the soil is not relevant and only its mechanical properties are pertinent. It is thus possible to classify the analogues into different categories.

Analogues and other samples for the EURO-CARES project: Analogue samples are complementary to other samples used during instrument development, which are not necessarily relevant to the extraterrestrial body being studied (such as a colour target used to calibrate a camera or a piece of silicon used to calibrate a Raman spectrometer, for example).

The objective of the H2020-funded EURO-CARES project (grant number 640190) is to create a roadmap for the implementation of a European Extraterrestrial Sample Curation Facility (ESCF) that would be suitable for the curation of samples from all possible return missions likely over the next few decades, *i.e.* from the Moon, asteroids and Mars. The EURO-CARES Work Package n°5, led by Frances Westall and Jutta Zipfel, is dedicated to the different kinds of samples needed in such a facility, including analogues *sensu stricto* as well as calibration, reference, witness and voucher samples and standards. More information about the project can be found on the website: www.euro-cares.eu.

References: [1] Bost *et al.*, (2013) *Planetary and Space Science* **82-83**, 113-127 [2] Bost *et al.*, (2015) *Planetary and Space Science* **108**, 87-97.